THE COMPOSITION AND PROPERTIES OF THE YUCCA PLANT.

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A SPECIES of yucca, botanically known as *Yucca angustifolia,* but more commonly called soap weed or Spanish bayonet, is found occurring abundantly on dry plains and hills from Nebraska to Montana, Texas and Arizona. Two other species are quite common—the *Yucca harrimaniæ,* found on the arid plains and hills of Utah and western Colorado, and the *Yucca baccata,* occurring from Colorado to Nevada, Texas and California.

In 1885 Abbott made the first chemical analysis of *Yucca angustifolia,* and in addition to the substances ordinarily reported present in plants closely related, found approximately six per cent of saponin. It is now known that the method used at that time gave high results, but, be that as it may, the fact that saponin was reported opened up a new field of investigation. Whether the saponin was toxic or not seems not to have been reported, but the conclusion was drawn that its presence in yucca was primarily for the purpose of rendering the insoluble soil constituents adaptable to the plant's growth and maintenance.

Several years ago it was reported that yucca contained an alkaloidal principle which was a specific for rheumatism when used internally. A careful investigation failed to produce positive results in this respect.

PROPERTIES AND USES OF SAPONINS.

Saponins, while not at all thoroughly understood, are at present used quite extensively. The saponins are mostly amorphous, colloidal substances which dissolve readily in water; their aqueous solutions, if shaken with oils, fats or resins, produce emulsions which are characterized by their great stability. Related with their emulsifying property is the employment of saponins as substitutes for soaps, although there is no evidence that yucca saponin is used for this purpose in the United States; yet it is true that in the East saponaceous soaps are preferred, since they have no deleterious effect on the color or the fiber of the most delicate fabrics.

Aqueous solutions of saponins have a marked power of retaining dissolved gases, as carbon dioxide; for this reason saponins are occasionally added to effervescent beverages, a use which is to be avoided in case the saponin is toxic.

PHYSIOLOGICAL ACTION.

The saponins are characterized by their strongly marked toxic properties. It is a well-established custom among fishermen to use saponins for killing fish. The fish so killed are not rendered unfit for human consumption.

By their powerful solvent action on the blood, saponins produce hæmolysis—a fact made use of in their identification.

PURPOSE OF INVESTIGATION.

Inasmuch as yucca is found abundantly in Kansas, especially so in the arid regions, it seemed advisable for the Department of the State Chemical Research of the University of Kansas to make a preliminary investigation of this plant, to answer, in a way, the numerous inquiries from over the state as to what use could be made of the plant commercially. The aim of the project was centered around the possibility of utilizing the saponin and fiber of the soap weed.

Without going into the details of the chemical analysis, which are found in the original report, the following summary will aid in holding in mind the general conclusions reached:

1. A method will have to be devised to obtain saponin directly. As it is at present, the percentage of saponin is estimated by measuring the hydrolytic products.

2. The maximum amount of saponin found in any part of the plant was two per cent—far too small an amount to profitably extract when the time of drying and expensive chemicals needed are considered.

3. After the plants are thoroughly dried, great care has to be exercised in preventing fermentation. Of course, on a small scale this factor can be easily avoided.

4. The fiber is much shorter than wood fiber; therefore a poor competitor, even though an inexpensive method could be devised for its preparation.

5. After the fiber has been dried it becomes brittle—a fact which is true of all vegetable fibers.

6. No chemical process has yet been found which will profitably separate the pith from the fiber without weakening the product.

7. It seems improbable that a method could be devised to strengthen the yucca fiber.

8. Fiber experts are of the opinion that a successful plan might be put into action whereby the fresh plants could be treated before they were air-dried. The aqueous extract obtained by the crushing could be developed, perhaps, for the saponin content.